

WHAT IS CLAIMED IS:

1. A tissue connector assembly comprising a surgical fastener, which is adapted to assume a loop configuration, a first tissue piercing member and a second tissue piercing member, said surgical fastener having a first end portion and a second end portion, said first tissue piercing member being coupled to said first end portion and said second tissue piercing member being coupled to said second end portion.

2. The tissue connector assembly of claim 1 further including a flexible member, said flexible member having a first end portion coupled to said first tissue piercing member and a second end portion coupled to said first end portion of said fastener.

3. The tissue connector assembly of claim 2 further including a second flexible member, said second flexible member having a first end portion coupled to said second tissue piercing member and a second end portion coupled to said second end portion of said fastener.

4. The tissue connector assembly of claim 3 wherein said first flexible member comprises a suture.

5. The tissue connector assembly of claim 3 wherein each of said flexible members comprises a suture.

6. The tissue connector assembly of claim 3 wherein at least one of said flexible members comprises metal.

7. The tissue connector assembly of claim 2 wherein said flexible member comprises a suture.

8. The tissue connector assembly of claim 2 wherein said flexible member comprises metal.

9. The tissue connector assembly of claim 1 wherein at least one of said tissue piercing members comprises a needle.

5 10. The tissue connector assembly of claim 1 wherein each of said tissue piercing members comprises a needle.

11. The tissue connector assembly of claim 1 further including a coupling, said first tissue piercing member and said first end portion of said surgical fastener being coupled to said coupling.

10 12. The tissue connector assembly of claim 11 wherein said coupling comprises a tubular member having movable portions and said surgical fastener includes an enlarged portion adapted for receipt in said movable portions.

13. The tissue connector assembly of claim 12 wherein said enlarged portion is spherical.

15 14. The tissue connector assembly of claim 12 wherein said movable portions comprise a plurality of strands.

15. The tissue connector assembly of claim 14 wherein a plurality of said strands include a notch for receiving a portion of said enlarged portion.

20 16. The tissue connector assembly of claim 14 wherein said strands comprise wires.

17. The tissue connector assembly of claim 14 wherein said strands comprise cables.

18. The tissue connector assembly of claim 11 including a second coupling, said surgical fastener second end portion and second piercing member being coupled to said second coupling.

5 19. The tissue connector assembly of claim 18 wherein said surgical fastener includes an enlarged portion and said second coupling comprises a generally tubular member having movable portions adapted to receive at least a portion of said second portion.

20. The tissue connector assembly of claim 19 wherein said movable portions comprise a plurality of strands.

10 21. The tissue connector assembly of claim 19 wherein a plurality of said strands include a notch for receiving a portion of said enlarged portion.

22. The tissue connector assembly of claim 18 wherein said second coupling releases the coupling between said second piercing member and said surgical fastener in response to releasing said fastener first end portion coupling.

15 23. The tissue connector assembly of claim 18 further including a coil surrounding said surgical fastener and wherein said fastener includes first and second enlarged portions and said fastener first end portion coupling and said second coupling are adapted for receipt of said fastener first and second enlarged portions, respectively, said second coupling including members having portions
20 that have a radially outward bias and extend within said coil when said coil is compressed against said second coupling.

24. The tissue connector assembly of claim 18 further including a flexible member and a coil, said flexible member having a portion coupled to said second tissue piercing member and a portion coupled to said second coupling, said coil
25 surrounding said surgical fastener and being compressed against said second

coupling, said fastener including an enlarged portion and said fastener first end portion coupling being adapted for receipt of said enlarged portion, said second coupling including a first member fixedly secured to said fastener and a second member slidably coupled to said fastener, and said flexible member being
5 compressed between said second coupling members when said coil is compressed against said slidably coupled member.

25. The tissue connector assembly of claim 18 wherein said fastener includes a groove and projection and said second coupling includes a member having a groove and projection and a sleeve slidably mounted thereon, said
10 fastener groove and projection being configured to mate with said coupling member groove and projection.

26. The tissue connector assembly of claim 18 further including a flexible member having a portion coupled to said second tissue piercing member and a knotted portion, said second coupling including a tubular member having a bore, said knotted portion being in said bore and said bore having a portion with a
15 diameter less than that of a section of said knotted portion.

27. The tissue connector assembly of claim 18 wherein said second coupling comprises an annular blade coupled to said second piercing member, said annular blade surrounding and being secured to a portion of said surgical
20 fastener.

28. The tissue connector assembly of claim 1 wherein said surgical fastener comprises a surgical clip.

29. The tissue connector assembly of claim 28 wherein said surgical clip comprises a wire.

30. The tissue connector assembly of claim 29 further including a coil surrounding at least a portion of said wire and having confined ends.

5 31. The tissue connector of claim 29 wherein said wire comprises shape memory material.

32. The tissue connector assembly of claim 28 wherein said surgical clip has an open configuration and a closed configuration.

33. The tissue connector assembly of claim 32 wherein said surgical clip is in said closed configuration when in a relaxed state.

10 34. The tissue connector assembly of claim 32 wherein said surgical clip is generally U-shaped when in said open configuration.

35. The tissue connector assembly of claim 32 wherein said surgical clip assumes a spiral configuration when in said closed configuration.

15 36. A tissue connector assembly comprising a surgical fastener having first and second end portions, a first tissue piercing member, a second tissue piercing member, and at least one flexible member having first and second end portions, said at least one flexible member first end portion being attached to said first tissue piercing member, said at least one flexible member second end portion being coupled to said first end portion of said surgical fastener, said second end
20 portion of said surgical fastener being coupled to said second tissue piercing member.

37. The tissue connector assembly of claim 36 wherein said at least one flexible member comprises a suture.

38. The tissue connector assembly of claim 36 wherein said at least one flexible member comprises metal.

39. The tissue connector assembly of claim 36 further including a coupling, said flexible member and surgical fastener being secured to said coupling.

40. The tissue connector assembly of claim 39 wherein said coupling and flexible member have outer surfaces, said coupling and flexible member being configured to form a smooth, continuous transition there between along said outer surfaces.

41. The tissue connector assembly of claim 39 wherein said coupling and flexible member form an interface, at least a portion of each of said coupling and flexible member adjacent to said interface having the same cross-sectional shape and dimension.

42. The tissue connector assembly of claim 39 wherein said coupling and flexible member have essentially the same cross-sectional shape and dimension.

43. The tissue connector assembly of claim 39 wherein said surgical fastener is releasably coupled to said coupling.

44. The tissue connector assembly of claim 39 wherein said surgical fastener includes an enlarged portion and said coupling comprises a tubular member having movable portions adapted to receive at least a portion of said enlarged portion.

45. The tissue connector assembly of claim 44 wherein said enlarged portion is spherical.

46. The tissue connector assembly of claim 44 wherein said movable portions comprises a plurality of strands.

47. The tissue connector assembly of claim 46 wherein a plurality of said strands include a notch for receiving a portion of said enlarged portion.

5 48. The tissue connector assembly of claim 46 wherein said strands comprise wires.

49. The tissue connector assembly of claim 46 wherein said strands comprise cables.

10 50. The tissue connector assembly of claim 39 including a second coupling, said surgical fastener second end portion and second piercing member being coupled to said second coupling.

15 51. The tissue connector assembly of claim 50 wherein said surgical fastener includes a second enlarged portion and said second coupling comprises a generally tubular member having movable portions adapted to receive at least a portion of said enlarged portion.

52. The tissue connector assembly of claim 51 wherein said movable portions comprise a plurality of strands.

53. The tissue connector assembly of claim 51 wherein a plurality of said strands include a notch for receiving a portion of said enlarged portion.

20 54. The tissue connector assembly of claim 50 wherein said second coupling releases the coupling between said second piercing member and said surgical fastener in response to releasing said fastener first end portion coupling.

55. The tissue connector assembly of claim 50 further including a coil surrounding said surgical fastener and wherein said fastener includes first and second enlarged portions and said fastener first end portion coupling and said second coupling are adapted for receipt of said fastener first and second enlarged portions, respectively, said second coupling including members that are biased radially inward with portions extending within said coil when said coil is compressed against said second coupling.

56. The tissue connector assembly of claim 50 further including a second flexible member and a coil, said second flexible member having a portion coupled to said second tissue piercing member and a portion coupled to said second coupling, said coil surrounding said surgical fastener and being compressed against said second coupling, said fastener including an enlarged portion and said fastener first end portion coupling being adapted for receipt of said enlarged portion, said second coupling including a first member fixedly secured to said fastener and a second member slidably coupled to said fastener, and said flexible member being compressed between said second coupling members when said coil is compressed against said slidably coupled member.

57. The tissue connector assembly of claim 50 wherein said fastener includes a groove and projection and said second coupling includes a member having a groove and projection and a sleeve slidably mounted thereon, said fastener groove and projection being configured to mate with said coupling member groove and projection.

58. The tissue connector assembly of claim 50 further including a second flexible member having a portion coupled to said second tissue piercing member and a knotted portion, said second coupling including a tubular member having a bore, said knotted portion being in said bore and said bore having a portion with a diameter less than that of a section of said knotted portion.

59. The tissue connector assembly of claim 50 wherein said second coupling comprises an annular blade coupled to said second piercing member, said annular blade surrounding and being secured to a portion of said surgical fastener.

5 60. The tissue connector assembly of claim 36 wherein said surgical fastener comprises a surgical clip.

61. The tissue connector assembly of claim 60 wherein said surgical clip comprises a wire.

10 62. The tissue connector assembly of claim 61 further including a coil surrounding at least a portion of said wire and having confined ends.

63. The tissue connector of claim 61 wherein said wire comprises shape memory material.

64. The tissue connector assembly of claim 60 wherein said surgical clip has an open configuration and a closed configuration.

15 65. The tissue connector assembly of claim 64 wherein said surgical clip is in said closed configuration when in a relaxed state.

66. The tissue connector assembly of claim 64 wherein said surgical clip is generally U-shaped when in said open configuration.

20 67. The tissue connector assembly of claim 64 wherein said surgical clip assumes a spiral configuration when in said closed configuration.

68. A tissue connector assembly comprising two needles, a surgical clip and a flexible member having a portion releaseably coupled to said surgical clip

and a portion coupled to one of said needles, the other one of said needles being coupled to said surgical clip.

5 69. The tissue connector assembly of claim 68 further comprising a second flexible member having a portion releaseably coupled to said surgical clip and a portion coupled to said other one of said needles.

10 70. Tissue connector apparatus comprising a wire, a tissue piercing member, a generally tubular member having first and second end portions and surrounding said wire and a coupling, said piercing member being coupled to said coupling and said coupling including members having portions that have a radially outward bias and extend within said tubular member second end portion, said tubular member second end portion being releasably constrained.

71. The apparatus of claim 70 wherein said generally tubular member is a coil.

15 72. Tissue connector apparatus comprising a surgical fastener, a tissue piercing member, a flexible member, a coupling, and a coil, said flexible member having a portion coupled to said piercing member and a portion coupled to said coupling, said coil surrounding said surgical fastener and being compressed against said coupling, said coupling including a first member fixedly secured to said fastener and a second member slidably coupled to said fastener, and said 20 flexible member being positioned between said coupling members, and said coil surrounding said surgical fastener and having one end releaseably constrained and the other end compressed against said slidably coupled member.

25 73. Tissue connector apparatus comprising a surgical fastener, tissue piercing member and a coupling said fastener including a groove and projection and said coupling including a member having a groove and projection and a

sleeve slidably mounted thereon, said fastener groove and projection being configured to mate with said coupling member groove and projection.

74. Tissue connector apparatus comprising a surgical fastener, a tissue piercing member, a flexible member having a portion coupled to said tissue piercing member and a knotted portion, and a tubular member having a bore, said fastener being coupled to said tubular member and said knotted portion being in said bore, said bore having a portion with a diameter less than that of a section of said knotted portion.

75. Tissue connector apparatus comprising a surgical fastener, an annular blade and a tissue piercing member, said tissue piercing member being coupled to said annular blade, and said annular blade surrounding and being secured to a portion of said surgical fastener.

76. A method of decoupling multiple tissue piercing members from a surgical fastener comprising actuating release of multiple piercing members, which are coupled to a surgical fastener, essentially simultaneously.

77. A method of decoupling multiple tissue piercing members from a surgical fastener comprising releasing multiple tissue piercing members, which are coupled to a surgical fastener, with a single release actuator.

78. A method of decoupling multiple tissue piercing members from a surgical fastener including simultaneously actuating release of multiple needles from a surgical fastener.

79. The method of setting a tissue connector assembly including a surgical fastener and multiple tissue piercing members coupled thereto comprising manipulating a single portion of the tissue connector assembly to both release the tissue piercing members from the fastener and actuate closure of the fastener.

80. A method of securing portions of material together, at least one of which comprises tissue, the method comprising placing at least a portion of a first piercing member, having a surgical fastener coupled thereto, in a vessel lumen, placing at least a portion of a second piercing member, which also is coupled to the surgical fastener and where at least one of the piercing members is coupled to the surgical fastener with a flexible member, in a tubular graft, passing the first piercing member through the wall of the vessel from an interior surface thereof, passing the second piercing member through the wall of the tubular graft from an interior surface thereof, and positioning the fastener with one portion thereof extending through said vessel wall and another portion extending through said graft wall.

81. The method of claim 80 wherein the flexible member is selected to be a suture.

82. The method of claim 80 wherein all of the at least one flexible member and the piercing members are removed from the fastener.